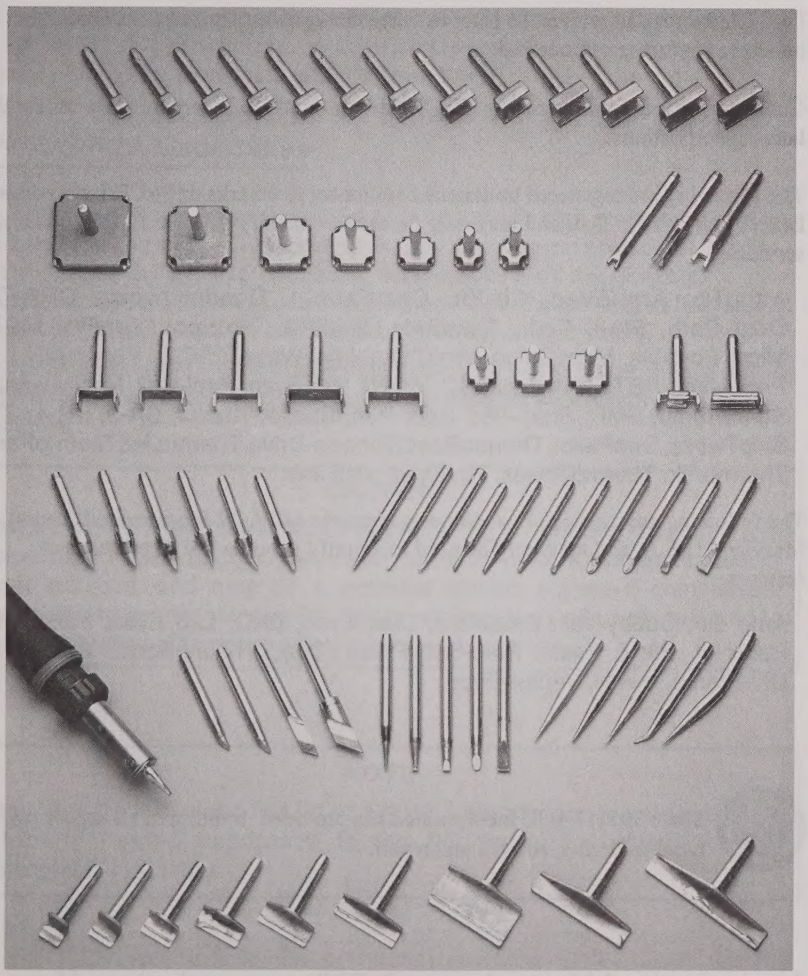
PACE® INCORPORATED

SP-1A/SP-2A SODR-PEN HANDPIECE

OPERATION & MAINTENANCE INSTRUCTIONS



Any Tip To Suit Your Needs!

MANUAL NUMBER 5050-0356 REV. C

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Since 1958, PACE Incorporated has provided training in all aspects of hand soldering, rework and repair.

Additional copies of this manual or other PACE literature may be obtained from:

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These instructions describe the basic operational guidelines for using the SP-1A and SP-2A handpieces. A detailed Operation & Maintenance Manual (P/N 5050-0366) is available from PACE.

SP-1A/SP-2A Capablities

The SP-2A Sodr-Pen (54 Watts) provides high capacity heating necessary to perform thru-hole soldering and SMT component removal/replacement operations. A wide variety of quick change, 3/16 inch shank, thru-hole and SMT tips (for chip components, SOTs, SOICs and other components) is available. Its slim line, natural balance design facilitates ease of use and manipulation in tight places.

The SP-1A Sodr-Pen (37 Watts) incorporates a smaller profile heater assembly using 1/8 inch shank, single point tips to access solder joints on very densely populated assemblies.

CAUTION

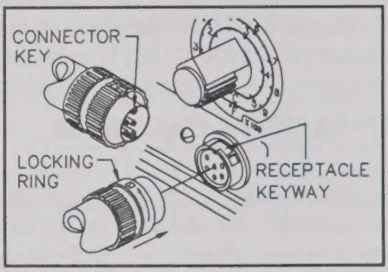
Always return heated handpieces to the SP Tip & Tool Stand when not in actual use. Failure to do so may cause burns to the operator, equipment or work surfaces, and may be a potential ignition source if combustible materials are nearby. Always use this handpiece in a well ventilated area to avoid inhalation of fumes created by solder flux gases.

NOTE

To extend tip life, clean the tip and re-tin using flux core solder before returning heated handpiece to the SP Tip & Tool Stand during handpiece inactivity.

Handpiece Setup

Connect the Sodr-Pen connector plug to one of the handpiece power receptacles on your PACE power source.



NOTE - If using the SP-1A or SP-2A for the first time or if you have just replaced the heater, we recommend that you follow the "Heater Burn-In" procedure (Red tag on handpiece) to increase the life expectancy of the heater.

Temperature Selection

Tip Temperature

Adjust the Tip Temperature to the desired temperature setting. Select and enter your desired true operating temperature that will provide rapid yet controllable melt of the entire solder joint. Begin with an operating temperature in the range of 316°C (600°F) and adjust as necessary. Tip temperatures in excess of 399°C (750°F) may cause damage to the PC assembly. For safest removal, some components on extra heavy assemblies may require preheating or auxiliary heating.

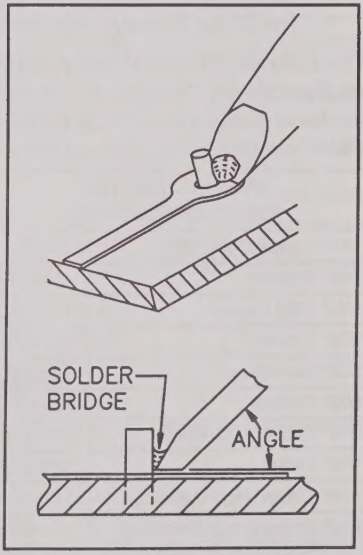
Tip Offset

Differences between the temperature settings and true tip temperatures are negligible when using Thru-Hole, single point soldering tips. With any heating system however, True Tip Temperatures can differ greatly from temperature settings when using larger SMT soldering tips. This difference is called Tip Temperature Offset. PACE recommends the use of the Tip & Temperature Selection System booklet (PACE P/N 5050-0251) as a guide to accurately set and maintain a true tip temperature for any size and type of SMT tip.

Tip Selection & Use

1. **HEAT TRANSFER**: Maximize thermal transfer by selecting the shortest, fattest tip with the largest surface contact area. Keep the tip clean and freshly tinned and clean the work of oxides or other residues.

   When soldering, angle the tip to the joint so that there is maximum surface contact area. The use of a "solder bridge" to enhance "thermal linkage" will also improve heat transfer.

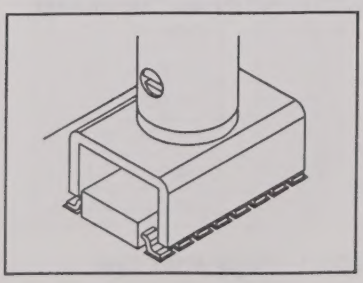


2. **TIP ACCESS & VISIBILITY:** The tip selected must easily contact the joint without touching the board substrate, adjacent components or other solder joints.

   Longer, thinner, more tapered tips allow the operator to more easily access and view the solder joint during soldering for better process control. However, such tips generally have much less heat transfer ability than shorter, fatter tips.

3. **TIP TEMPERATURE:** Use the lowest tip temperature which will achieve rapid yet controllable melt of the entire joint(s). Begin with a temperature of 316°C (600°F) and adjust as necessary to suit the particular application and operator skill level.

   Lower tip temperatures reduce the risk of damage and increase tip life.



4. **SMT REMOVAL:** Tips for SMT removal applications must fit over (or around) the component body, and contact all the solder joints at once. When all the solder joints reflow completely, remove the component.

5. **HANDPIECES:** The SP-2A Sodr-Pen uses 3/16" shank tips providing maximum heat transfer for Surface Mount and multilayer board applications.

   The SP-1A Sodr-Pen uses 1/8" shank tips and features a slimmer, more]

The following tables detail a listing of available single point and SMT tip configurations (current at the time of publication of this manual). Contact the local authorized PACE distributor for the Tip & Applications catalog which contains the most current, complete list of tips available.

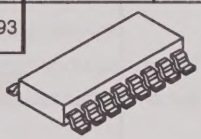
3/16" SHANK TIPS (for SP-2A Sodr-Pen)	
DESCRIPTION	PART #
1/64" Conical	1121-0357
1/64" Bent Conical	1121-0363
1/32" Chisel	1121-0359
1/32" Bent Chisel	1121-0361
1/32" Conical	1121-0336
1/16" Chisel (MicroFine)	1121-0349
1/16" Chisel	1121-0335
1/16" Chisel (High Capacity)	1121-0414
1/16" Chisel (Long Reach)	1121-0499
1/16" Bent Chisel (Long Reach)	1121-0500
3/32" Chisel	1121-0360
1/8" Chisel	1121-0337
3/16" Chisel	1121-0358
Single Sided Chisel	1121-0406
1/4" Flat Blade	1121-0402
0.40" Flat Blade	1121-0305
Mini-Wave	1121-0490

***These tips (1/8" shank) can be installed in the SP-2A Sodr-Pen using the PACE AdapTip (Part Number 1360-0083-P1).**

3/16" SHANK EXTENDED REACH TIPS (for SP-2A Sodr-Pen)	
DESCRIPTION	PART #
1/64" Conical	1121-0528
1/32" Conical	1121-0527
1/16" Chisel	1121-0533
3/32" Chisel	1121-0529
1/8" Chisel	1121-0530
3/16" Chisel	1121-0531
Single Sided Chisel	1121-0532
3/16" SHANK THERMO-DRIVE TIPS (for SP-2A Sodr-Pen)	
1/64" Conical	1121-0516
1/64" Bent Conical	1121-0526
3/64" Chisel	1121-0524
3/64" Bent Chisel	1121-0525
1/16" Chisel	1121-0510
1/8" Chisel	1121-0518
1/8" SHANK TIPS* (for SP-1A Sodr-Pen)	
1/32" Conical (1.65" long)	1121-0503
1/16" Chisel (1.65" long)	1121-0502
1/8" Chisel (1.65" long)	1121-0501
Single Sided Chisel (1.65" long)	1121-0504
1/32" Conical (2" long)	1121-0132
1/32" Conical, MicroFine (2" long)	1121-0339
1/32" Conical, High Capacity (2" long)	1121-0340
1/16" Chisel (2" long)	1121-0131
1/8" Chisel (2" long)	1121-0130
Single Sided Chisel (2" long)	1121-0238

Table I. Single Point Tips

Suggested Application	TIP SIZE A X B	PART NUMBER	Suggested Application	TIP SIZE A X B	PART NUMBER
SOIC - 8	0.199" x 0.200" (5.05mm x 5.08mm)	1121-0390	SOICL - 20	0.369" x 0.522" (9.37mm x 13.3mm)	1121-0394
	0.246" x 0.190" (6.25mm x 4.83mm)	1121-0438		0.269" x 0.510" (6.83mm x 13.0mm)	1121-0378
SOIC - 14	0.199 x 0.354" (5.05mm x 8.99mm)	1121-0391	SOICL - 24	0.369" x 0.624" (9.37mm x 15.8mm)	1121-0395
	0.219 x 0.360" (5.56mm x 9.14mm)	1121-0377		0.416" x 0.590" (10.6mm x 15.0mm)	1121-0441
SOIC - 16	0.199" x 0.404" (5.05mm x 10.2mm)	1121-0392	SOICL - 28	0.369" x 0.723" (9.37mm x 18.4mm)	1121-0396
	0.292" x 0.390" (7.42mm x 9.91mm)	1121-0439		0.416" x 0.690" (10.6mm x 17.5mm)	1121-0442
SOICL - 16	0.369" x 0.423" (9.37mm x 10.7mm)	1121-0393			



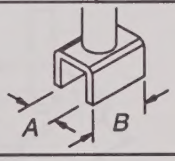


Table II. SOIC Surface Mount Removal Tips

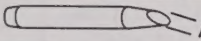
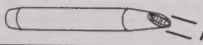
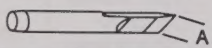
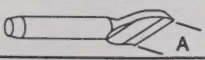
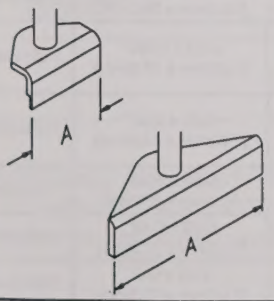
TIP OUTLINE	DESCRIPTION	TIP SIZE A	PART NUMBER
	Single Sided Chisel	A = 0.13" (3.3mm)	1121-0406
	Mini-Wave	A = 0.13" (3.3mm)	1121-0490
	Flat Blade	A = 0.25" (6.6mm)	1121-0402
	Flat Blade	A = 0.40" (10.2mm)	1121-0305
	Flat Blade	A = 0.3" (7.6mm)	1121-0512
		A = 0.4" (10.2mm)	1121-0514
		A = 0.5" (12.7mm)	1121-0473
		A = 0.7" (17.8mm)	1121-0416
		A = 0.8" (20.3mm)	1121-0497
		A = 1.0" (25.4mm)	1121-0448
		A = 1.25" (31.8mm)	1121-0495
		A = 1.5" (38.1mm)	1121-0475
		A = 2.0" (50.8mm)	1121-0477

Table III. Surface Mount Installation Tips

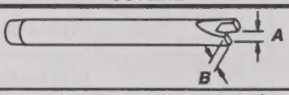
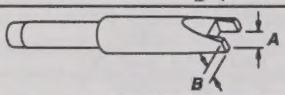
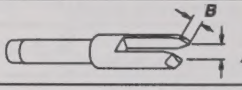
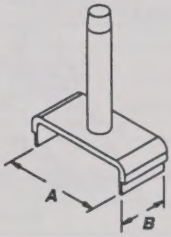
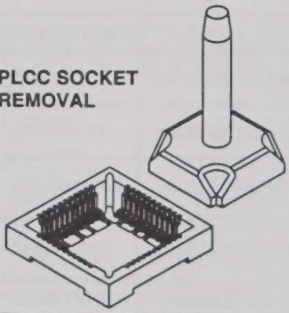
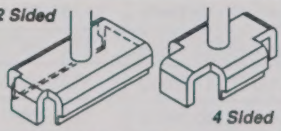
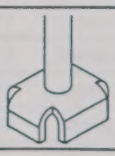
TIP OUTLINE	DESCRIPTION (suggested application)	TIP SIZE A X B	PART NUMBER
	Chip Component	0.093 x 0.080" (2.36mm x 2.03mm)	1121-0302
		0.14 x 0.08" (3.56mm x 2.03mm)	1121-0303
	SOT-23	0.063 x 0.12" (1.6mm x 3.05mm)	1121-0304
	TSOP (Thin Small Outline Pkg.)	0.500" x 0.32" (12.7mm x 8.19mm)	1121-0508
		0.60" x 0.25" (15.2mm x 6.4mm)	1121-0389
		0.76 x 0.32" (19.3mm x 8.1mm)	1121-0403
		0.76 x 0.39" (19.3mm x 9.9mm)	1121-0509
		0.760 x 0.56" (19.3mm x 14.2mm)	1121-0534
PLCC SOCKET REMOVAL 	PLCC-20 SOCKET	0.34" x 0.34" (8.6mm x 8.6mm)	1121-0511
	PLCC-28 SOCKET	0.45" x 0.45" (11.4mm x 11.4mm)	1121-0481
	PLCC-32 SOCKET	0.55" x 0.45" (14.0mm x 11.4mm)	1121-0429
	PLCC-44 SOCKET	0.65" x 0.65" (16.5mm x 16.5mm)	1121-0430
	PLCC-52 SOCKET	0.75" x 0.75" (19.1mm x 19.1mm)	1121-0431
	PLCC-68 SOCKET	0.95" x 0.95" (24.1mm x 24.1mm)	1121-0432
	PLCC-84 SOCKET	1.15" x 1.15" (29.2mm x 29.2mm)	1121-0482
	SOJ/SIMMs - 20/24 (2 sided)	0.30 x 0.680" (7.62mm x 17.3mm)	1121-0460
	SOJ/SIMMs - 18 (4 sided)	0.30 x 0.53" (7.62mm x 13.5mm)	1121-0458
	Small FlatPack	0.33 x 0.33" (8.4mm x 8.4mm)	1121-0443
		0.46 x 0.46" (11.7mm x 11.7mm)	1121-0445
		0.46 x 0.5" (11.7mm x 12.7mm)	1121-0446

Table IV. Surface Mount Removal Tips

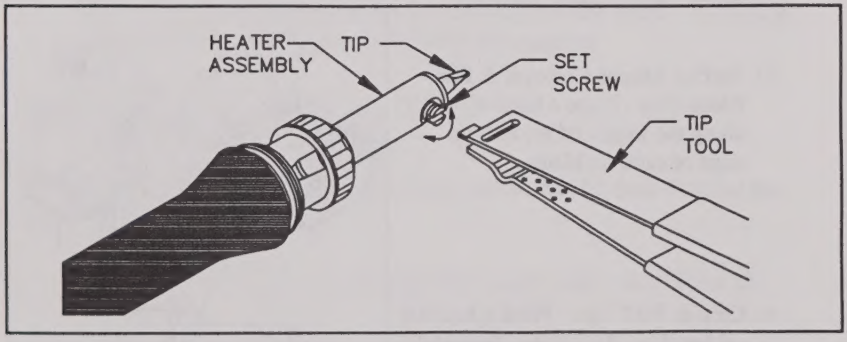
Tip Installation

The following instructions are for tip installation only. If a tip is currently installed in the handpiece, loosen the heater set screw and remove the installed tip using the PACE Tip Tool.

CAUTION

Hold the handpiece with the heater pointed up to prevent injury to personnel.

2. Select the proper tip for your application. Refer to Table I or the PACE Tip & Applications Catalog.
3. Install the selected tip in the following manner.
   a) Hold the handpiece with the heater up at an angle (heater hot).
   b) Insert the Tip all the way into the heater bore using the PACE Tip Tool.
   c) Gently tighten the heater Set Screw.



NOTE

Periodically, clean the heater bore with a properly sized wire brush (3/16" O.D. with SP-2A and 1/8" O.D. with SP-1A) to insure a low tip-to-ground resistance and maximum heat transfer.

Tip Preparation

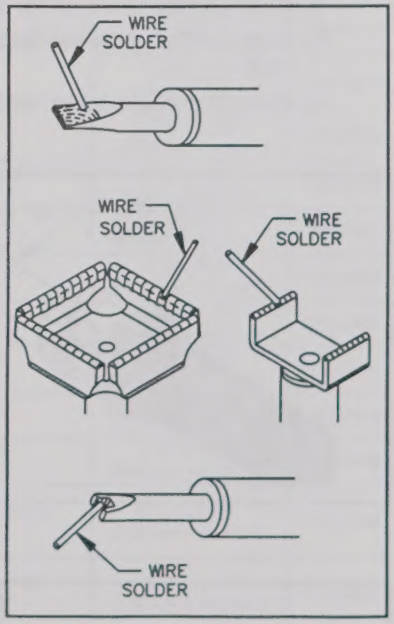
Proper preparation will insure optimum results and increase tip life. Follow this procedure before each component removal, installation or lead/land preparation operation and prior to storage of the handpiece in the SP Tip & Tool Stand.

1. Insure that the installed tip has reached the selected tip temperature.
2. Remove all solder dross and flux residue from the tip.
3. Wipe the tip using the moistened Sponge Tool or the moistened sponge area of the SP Tip & Tool Stand.
4. Using a large gauge, flux core wire solder, tin the tip end as follows. Proper tinning enhances heat transfer to lead/land areas.

a) Single Point Tips - Place a small amount of solder on each surface of the tip end. Wipe off excess solder (except Mini-Wave tip).

b) Surface Mount Removal & Flat Blade Tips - Place a bead of solder along the length of the bottom edge of each tip blade.

c) Chip & SOT Tips - Place a bead of solder along the inside edges of the tip end.



NOTE - Proper tinning of the tip will significantly contribute to long tip life. For best results, there should be a continuous bead of solder on the bottom edge of each tip blade at the completion of the tinning operation. Before returning handpiece to the SP Tip & Tool Stand, clean and re-tin the tip using flux core solder to prevent oxidation.

5. The Sodr-Pen is now ready for use. If not immediately using the handpiece, return it to its proper place in the SP Tip & Tool Stand.

PCB /Component Preparation

Proper land preparation is the key to successful assembly rework and repair. To obtain optimum results, follow these steps.

1. Clean the lead/land area using an approved solvent or cleaner.

2. Insure that the PCB is free of moisture. You may wish to gently dry the land (or land pattern) area using a heated air tool (e.g., PACE Mini ThermoJet handpiece).

3. For SMT component installation applications, tin and flux lead/land areas or apply solder paste.

4. Some assembly substrates such as ceramic and polyamide as well as those incorporating large ground planes or multilayer technology may require the use of preheating to prevent thermal shock to the board. The PACE HotSpot (HS 150) is recommended for this purpose.

SMT Component Removal

For SMT Component Removal applications, use the SP-2A Sodr-Pen and the appropriate 3/16 inch shank tip.

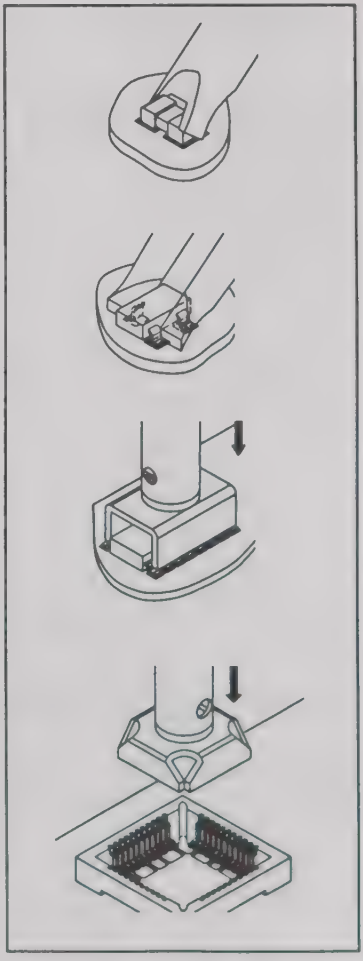
1. Select and install the proper tip for your application. See Tables III through V.

2. Select proper tip and offset temperatures for your application. In general, a starting tip temperature of 316°C (600°F) is recommended. Allow the handpiece to reach and stabilize at the set temperature. Depending on the power source used, a digital readout or flashing LED will indicate tip temperature stabilization.

3. Place the pcb assembly on a flat work surface or in a pcb holder.

4. Clean and tin the tip. See "Tip Preparation".

5. Position the handpiece with tip down, directly over the component. Orient the tip blades with component leads/lands.
6. Lower the handpiece until the tip blades contact the lead/land solder joints. When removing PLCC sockets, wedge the tip inside the socket to transfer heat through the socket contacts.
7. Complete solder melt should be observed in 1 - 6 seconds (30 - 60 seconds on PLCC sockets). If complete melt has not been achieved, in 6 seconds (60 seconds for PLCC sockets), remove the tip and allow solder joints to cool.
8. Gently lift handpiece. The component will lift from the pcb and remain on the tip blades due to the capillary action of the solder on the tip and component. If the component does not lift with the tip, add solder to all lead/land areas and re-tin tip. Allow component to cool before repeating procedure.
9. Drop the component onto an insulated surface by gently shaking handpiece.
10. Clean the tip and re-tin using a flux core solder.



NOTE - Always clean the tip and re-tin using a flux core solder before returning handpiece to the SP Tip & Tool Stand during handpiece inactivity. Tinning with flux core solder will prevent oxidation and extend tip life.

Thru-Hole Component Installation

Perform the following procedure to obtain optimum results for soldering applications.

1. Select and install the proper tip for your application.

2. Select proper tip and offset temperatures for your application. In general, a starting tip temperature of 316°C (600°F) is recommended. Allow the handpiece to reach and stabilize at the set temperature. Depending on the power source used, a digital readout or flashing LED will indicate tip temperature stabilization.

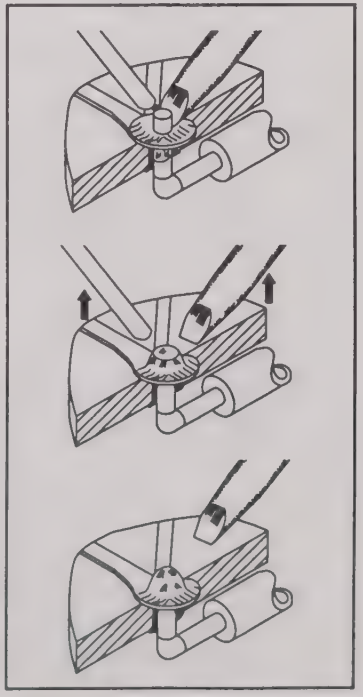
3. Clean and tin the tip. See "Tip Preparation".

4. Place the pcb assembly on a flat work surface or in a pcb holder.

5. Position the tip gently on the land (pad) and against the component lead with the handpiece held at a 45 degree angle to the pcb surface.

6. Place a small amount of solder between the top tip end surface and the component lead to create a solder bridge which will maximize heat transfer.

7. After complete solder melt is observed, add solder if needed. Lift the tip from the land and wipe up the component lead. Allow the solder joint to cool. The solder fillet should be concave.



NOTE - Contact between the tip and land must be maintained with the solder heat bridge to obtain maximum thermal linkage. Downward pressure against lands must be minimized to avoid lifting of lands.

10. Clean the tip and re-tin using a flux core solder.

NOTE - Always clean the tip and re-tin using a flux core solder before returning handpiece to the SP Tip & Tool Stand during handpiece inactivity. Tinning with flux core solder will prevent oxidation and extend tip life.

SMT Component Installation

Perform the following procedure to obtain optimum results for soldering applications.

1. Select and install the proper tip for your application.

2. Select proper tip and offset temperatures for your application. In general, a starting tip temperature of 316°C (600°F) is recommended. Allow the handpiece to reach and stabilize at the set temperature. Depending on the power source used, a digital readout or flashing LED will indicate tip temperature stabilization.

3. Place the pcb assembly on a flat work surface or in a pcb holder.

4. Prefill one land with solder when installing chip or SOT components or 2 opposing corner lands when installing multi-lead components (e.g., SOICs, PLCCs, QFPs).

5. Position component on lands. Hold component in place using tweezers or a vacuum pick device such as the PACE Pik-Vac or HandiPik.

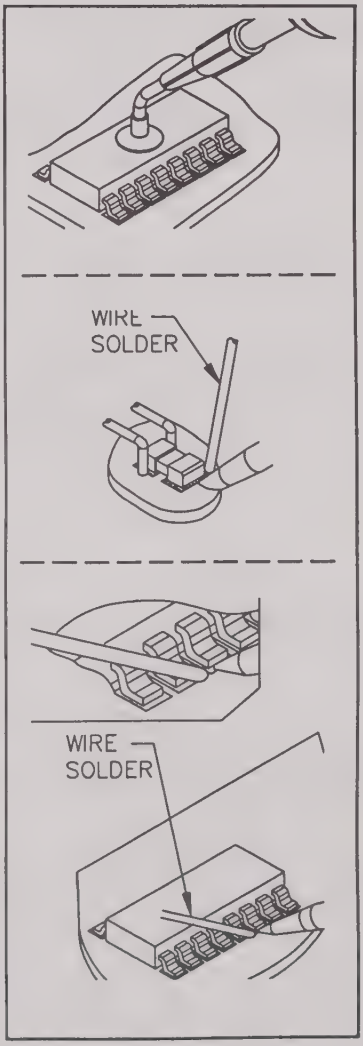
6. Solder the prefilled lead/land connection(s). When soldering chip components, touch the tip to the land only; do not touch the component termination. Touching of terminal ends directly with the tip may cause leaching of or thermal shock to component.

7. Flux all lead/land areas.

8. Position the tip gently on each lead/land and solder with the flat end of the tip placed against the component lead (against the land for chip components) and the handpiece held at a 45 degree angle to the pcb surface.

9. Repeat step 8 on all lead/land connections along all edges of the component until all connections have been soldered.

10. Clean the tip and re-tin using a flux core solder.



NOTE - Always clean the tip and re-tin using a flux core solder before returning handpiece to the SP Tip & Tool Stand during handpiece inactivity. Tinning with flux core solder will prevent oxidation and extend tip life.

Special Applications

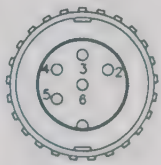
If you require assistance in the use of this handpiece or require assistance with a special application, contact PACE Applications Engineering at:

Telephone: (301) 490-9860
Fax: (301) 604-9215

Corrective Maintenance

Use Table V and the illustration to determine the condition of your handpiece. Disconnect the handpiece from the power source. Perform the "Heater Assembly Checkout Procedures" shown below with the Sodr-Pen (and heater) at room temperature. If the heater assembly is warm, resistance readings will be different from those shown in the table under "Heater Specifications". Use a meter to check the resistance across the handpiece Connector Plug Pinouts outlined in the "Checkout Procedure" column.

Symptom	Checkout Procedure	Cause	Solution	Heater Specifications
No heat.	Check resistance - Pin 2 to Pin 5. Refer to "Heater Specifications" column. If resistance is high - -	Open Heater.	Replace Heater Assembly.	SP-1A = 10 - 12 ohms SP-2A = 8 - 10 ohms
	Check resistance - Pin 3 to Pin 6. If circuit reads open - -	Open Sensor.	Replace Heater Assembly.	
Handpiece overheating LED is Red.	Check resistance - Pin 3 to Pin 6. Resistance should be 110 ohms. If resistance is less than 105 ohms - -	Shorted Sensor.	Replace Heater Assembly.	
Fuse blows when unit is turned on.	Check resistance - Pin 2 to Pin 5. Refer to "Heater Specifications" column. If resistance is low - -	Solder short in Handpiece.	Remove Short. Replace Heater Assembly & Fuse.	
		Shorted Heater.	Replace Heater Assembly & Fuse.	
No Ground on Tip.	Check resistance - Pin 4 to a NEW Tip. Resistance should be less than 2 ohms. If not - -	Oxidation in Heater Bore.	Clean Heater Bore using appropriate wire brush.	
		Defective Heater.	Replace Heater Assembly.	

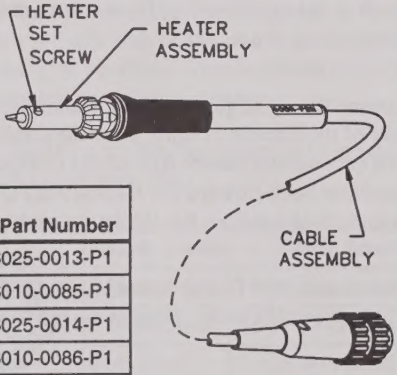


Connector Plug Pinouts

Table V. Heater Assembly Checkout Procedures

Replacement Parts

Listed are the replacement parts which may be ordered through your local authorized PACE distributor. To obtain any other replacement parts, contact PACE Customer Service directly at Tel. #(301) 490-9860 or FAX #(301) 604-9215.



Item #	Description	Part Number
1	SP-1A Sodr-Pen Handpiece	6025-0013-P1
2	SP-1A Heater Assembly (37 Watt)	6010-0085-P1
3	SP-2A Sodr-Pen Handpiece	6025-0014-P1
4	SP-2A Heater Assembly (54 Watt)	6010-0086-P1
5	Heater Set Screw	1348-0547-P10

Table VI. Handpiece Replacement Parts

Heater Replacement

Insure that the installed heater assembly on your handpiece is defective by referring to Table V (Heater Assembly Checkout Procedures). If replacement becomes necessary, follow the procedure below for best results.

1. Disconnect the Sodr-Pen® from the power source.
2. Unscrew, remove and discard the Heater Retaining Nut. If the Heater Retaining Nut does not unscrew easily, gently apply a back and forth side force to the tip end of the Heater Assembly to release the heat seal created after extended use.
3. Loosen the white plastic Strain Relief Screw (if present) located at the rear of the Handle. Gently push the Cable Assembly through the Sodr-Pen (toward the Heater Assembly) to expose the Insulator. Slide the Insulator back (toward the Handle end) to expose the 5 lead wire connections between the Heater Assembly and the Cable Assembly.
4. Disconnect the 5 Heater Assembly leads. Remove the Insulator from the Cable Assembly leads. Discard the old Heater Assembly and Insulator.
5. Feed the Cable Assembly leads back through the replacement Insulator with the notched end of the Insulator facing the Heater Assembly end. Feed the 2 Blue leads through the holes marked with the letter "B" and the 2 White leads through the holes marked "W". Feed the Green lead through the unmarked hole. Insure that the Cable Assembly leads do not become crossed with each other.
6. Plug the wire leads of the replacement Heater Assembly into the wire leads of the Cable Assembly using the table shown in the illustration as a reference. Match like colored wires. Connect the Green Cable Assembly lead to the non-insulated Heater Assembly lead. Insure that the leads do not become crossed with each other.
7. Slide the Insulator over the lead connections and against the back of the heater housing. The metal tab on the heater housing (Heater Tab) must slide in the Wide Notch (see illustration) on the end of the Insulator.

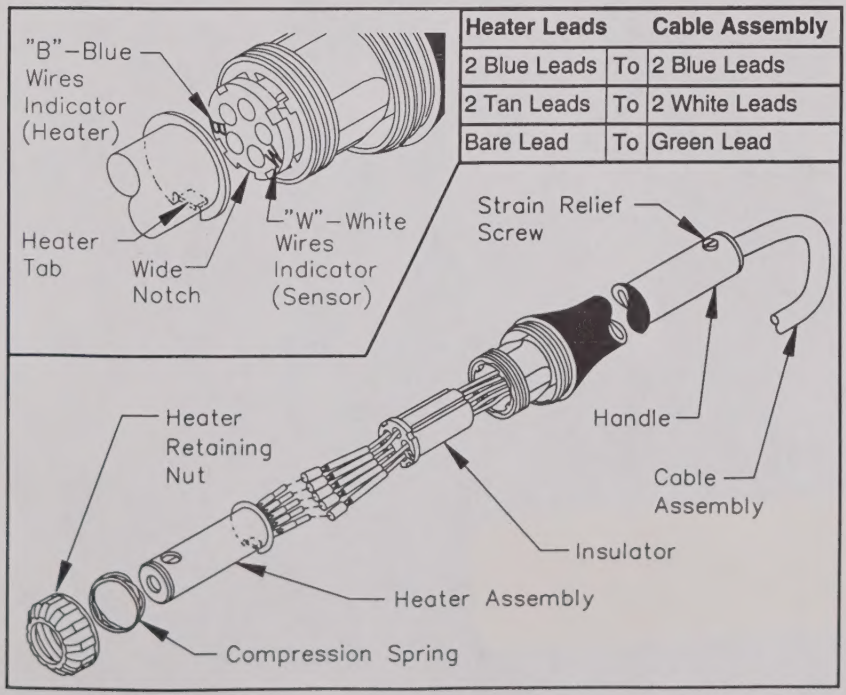
8. Gently pull the Cable Assembly back through the handpiece until the Heater Assembly rests against the plastic Handle. Gently twist the Heater Assembly (if necessary) to slide the narrow notches on the Insulator between the tabs on the inside of the Handle.

9. Place the new metal Compression Spring over the end of the Heater Assembly .

10. Install the new Heater Retaining Nut to secure the Heater Assembly and Compression Spring to the Handle.

11. Tighten the white plastic Strain Relief Screw (if present) located at the rear of the Handle until the screw is flush with or just above the Handle surface to secure the cable assembly in position. A replacement screw is supplied in the event that replacement becomes necessary.

12. Perform the Burn In procedure (listed on the Red tag packaged with the replacement Heater Assembly) to insure long life.



Heater Leads		Cable Assembly
2 Blue Leads	To	2 Blue Leads
2 Tan Leads	To	2 White Leads
Bare Lead	To	Green Lead

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